Assignment 6

Engine Maintenance (cont'd); Reduction Gears and Related Equipment

Textbook Assignment: Engineman 1&C, NAVEDTRA 10543-E1, Pages 4-1 through 4-11

Learning Objective: Recognize conditions which may affect reduction gear operations and the necessary corrective actions to be taken.

6-1. Under normal conditions, which of the following activities effects repairs to the main reduction gears?

1. Ship's force
2. Repair ships
3. Manufacturer
4. Naval shipyards

6-2. To ensure that gears are properly lubricated, an engineman must ensure that which of the following conditions are met?

1. The oil is clean
2. The oil is kept at the correct temperature
3. The proper amount of oil is supplied to the gears and bearings
4. All of the above

● Question 6-3 is to be judged True or False.

6-3. The reduction gear manufacturer designates the exact relief valve settings and pressure to be maintained in the lubrication system to ensure an adequate supply of oil to the gears and bearings.

6-4. What is the likely result of delivering too little or too much oil to a bearing?

1. An overheated bearing
2. An underheated bearing
3. A drop in oil pressure
4. A drop in oil temperature followed by a sharp rise in pressure

6-5. Under any operating condition, what is the maximum permissible temperature rise for oil passing through engine bearings.

1. 50°F
2. 60°F
3. 65°F
4. 70°F

6-6. What is the maximum allowed temperature of the oil leaving any reduction gear or bearing?

1. 165°F
2. 175°F
3. 180°F
4. 195°F

6-7. Fine metal flakes are usually produced during run-in of new gears. These fine metal particles, if not removed from the reduction gear lube oil system, may cause which of the following troubles?

1. Wiped bearings and scored journals
2. Clogged spray nozzles
3. Deteriorated gear teeth
4. All of the above

6-8. Which of the following types of damage to gear teeth surfaces are most likely to result if lubricating oil is contaminated by water?

1. Erosion and corrosion
2. Corrosion and pitting
3. Corrosion and scoring
4. Erosion and scoring

6-9. The journals of the main gear are severely corroded because of lube oil contamination. What repair work should be done as soon as possible?

1. Overhaul of the gears at a naval shipyard
2. Removal of metal flakes from the oil system
3. Realignment of the reduction gears
4. Replacement of the pinion bearings

6-10. How long, after securing the main reduction gear, should you circulate the lubricating oil through the system?

1. 15 minutes
2. Until the temperature of the oil is the same as the reduction gear casing
3. Until the temperatures of the oil and reduction gear casing are approximately the same as the engineroom temperature
4. 30 minutes

6-11. How can you eliminate the condensation of water from the inside of a reduction gear casing?

1. Keep the gear oil heated until condensation evaporates
2. Ensure the gear oil circulates at all times so that the water may be centrifuged out
3. Renovate the gear oil in a purifier while a cooler is operated and the gear is jacked
4. Allow the gear oil to remain unstirred so that water may settle to the bottom of the casing

6-12. Satisfactory operation of which of the following components should keep the lube oil in good condition?

1. Centrifuge and blower
2. Strainer and filter
3. Spray nozzles and heater
4. Purifier and settling tanks

● Question 6-13 is to be judged True or False.

6-13. Reduction gear lube oil samples should be taken and sent to a naval shipyard laboratory only once a quarter to be tested for contamination.

6-14. What substances cause gear lubricating oil to emulsify?

1. Freshwater and seawater
2. Fatty acids
3. Air bubbles
4. Insoluble minerals

6-15. What should be done if the lube oil begins to emulsify?

1. The plant should be stopped and the oil removed
2. The oil should be heated to just below the boiling point
3. The oil should be centrifuged to get rid of the water and the acid
4. The oil should be allowed to settle to get rid of the water and the acid

6-16. Assume that during operation, the lubricating oil level in the sump of the reduction gear rises high enough to come into contact with the bull gear. What is likely to result if this situation is NOT corrected?

1. The oil will overheat
2. The oil will become emulsified
3. The oil will be trapped in the sump
4. The oil will be contaminated with water

6-17. What should you do first in case of a burned-out pinion bearing?

1. Stop the engine
2. Align the gear teeth
3. Stop the main propeller shaft
4. Slow down the engine

6-18. What is the first probable cause to be considered when a vibration occurs in a reduction gear that previously had been operating properly?

1. Bent propeller shaft
2. Bent propeller blade
3. Unbalanced bull gear
4. Misaligned pinion gear

Learning Objective: Explain the methods of checking bearing clearances and identify the main troubles encountered with reduction gear bearings.

6-19. Which of the following information, recorded in prescribed engineering records, should be available for checking the alignment of the reduction gear?

1. Gear teeth root clearances and backlash
2. Thrust bearing clearances and settings
3. Original bearing clearances and crown thickness
4. All of the above information

6-20. Aboard ship, special equipment is usually available to perform which of the following maintenance tasks?

1. Replace bearings
2. Lift reduction gear covers
3. Take readings
4. All of the above

6-21. Which of the following methods is used to check the amount of bearing wear in the main reduction gears?

1. Bridge gage
2. Crown thickness
3. Radial clearance
4. Axial clearance

6-22. The pressure-bearing half of a main reduction gear bearing shell is readily identified by which of the following means?

1. A scribe line on each end of the shell
2. Three scribe lines on each end of the bearing shell
3. The letter A on each end of the shell
4. The letters B, C, and D on each end of the shell

● Question 6-23 is to be judged True or False.

6-23. During the initial alignment, the crown thickness of each reduction gear bearing shell should be measured at each scribe line and the clearance permanently stamped close to each scribe line.

6-24. What action should be taken if a bearing in a main reduction gear wipes during a trial run?

1. The gear and shaft should be operated at reduced speed
2. The gear should be provided with additional lubrication
3. The gear and shaft should be secured
4. The gear should be cooled with water

6-25. Before emergency repairs are to be attempted on the main reduction gear by the ship's force, what factors should be considered?

1. Ship's location and availability of repair activity
2. Ship's operational schedule and capability of personnel
3. knowledge of construction details and manufacturer's instructions
4. All of the above factors

6-26. What action should you take when replacing a wiped outboard pinion bearing in the reduction gear?

1. Compare the crown thickness of the new bearing with the original crown thickness of the old bearing
2. Compare the new bearing and the old bearing with the manufacturer's specifications
3. Accomplish 1 and 2 above
4. Measure the crown thickness of the new bearing and stamp it just prior to installation

6-27. Assume that you are installing a new bearing. When is the bearing cap lowered into place and bolted down?

1. After the lower bearing half is rolled into position
2. After the upper bearing half is placed in position
3. After the bearing and the dowel are in proper positions
4. After all of the above steps have been accomplished

6-28. If a pinion bearing fails, the shaft at that end tends to

1. move toward the bull gear
2. become scored and pitted
3. move away from the bull gear
4. become cracked and chipped

6-29. After a loss of lubricating oil casualty has occurred to the main reduction gear, what bearings should be checked first?

1. Thrust bearings
2. Pinion bearings
3. Bull gear shaft bearings
4. Main propulsion shaft bearings

6-30. What precautions must you observe when working around or inspecting an open reduction gear?

1. All tools must be secured with a suitable line
2. All loose articles must be taken from the clothing
3. The area around the gears must be covered and clean
4. All of the above

Learning Objective: Recognize the importance of proper gear tooth clearance and contact; describe the methods used to check clearances and tooth contact; and indicate what corrective action may be necessary.

6-31. Which of the following situations requires that a main reduction gear be given a wearing-in run before being run at full power?

1. New bearings have been installed
2. Old bearings have been resurfaced
3. The gears have been realigned
4. The gear teeth have been stoned

6-32. In main reduction gears, why is it necessary to align gears and provide for the proper clearances?

1. To ensure uniform distribution of pressure over the total area of the tooth faces
2. To prevent dirt and foreign matter from entering the gears
3. To ensure the proper appearance of the gears
4. To ensure that the proper oil pressure is maintained

6-33. When the original tooth contour is destroyed, what type tooth contact takes place?

1. Rolling
2. Metallic
3. Rubbing
4. Sliding

● Question 6-34 is to be judged True or False.

6-34. Initial pitting of new gears may develop during the wearing-in. Slight pitting does NOT affect the operation of the gears.

6-35. In reduction gears, the lead wire method is most useful in measuring the

1. depth of oil clearance
2. extent of bearing wear
3. designed root clearance
4. irregularity of the bearing wear

● Question 6-36 is to be judged True or False.

6-36. Noisy operation and insufficient contact of the reduction gear teeth may result unless the gear and pinion are properly aligned.

6-37. When you are checking the length of tooth contact between reduction gear pinions and gears, which of the following substances is recommended for metal coating?

1. Potassium permanganate
2. Zinc chromate
3. Prussian blue
4. Either 2 or 3 above

6-38. Roughened gear teeth may be stoned smooth provided the deterioration is due to which of the following actions?

1. Destructive pitting
2. Foreign particles
3. Initial pitting
4. Backlash

6-39. How should the high part of a reduction gear tooth be checked?

1. By inserting a feeler gauge between the teeth
2. By inserting a soft plastic wire between the teeth
3. By spotting-in with bluing
4. By taking leads

6-40. What percentages of the working surface of a reduction gear tooth must show contact to indicate a satisfactory tooth bearing?

1. 95 percent of the axial length and 80 percent of the width
2. 80 percent of the axial length and approximately 100 percent of the width
3. 100 percent of the axial length and 75 percent of the width
4. 75 percent of the axial length and 100 percent of the width

6-41. What method should be used to remove a high spot or deformation on a reduction gear tooth?

1. Scraping
2. Stoning
3. Lapping
4. Filing

Learning Objective: Indicate the function of a main thrust bearing and the methods used to check end play of a shaft.

6-42. In a Kingsbury type thrust bearing, which of the following is one of the purposes of the shoe?

1. To equalize the thrust load
2. To transmit the thrust from the collar
3. To hold the leveling plates in place
4. To receive the thrust from the leveling plates

6-43. Some thrust bearing installations are furnished lubricating oil by the same system that lubricates which of the following parts?

1. Main shaft bearings
2. Stern tube bearings
3. Reduction gears
4. All of the above

6-44. Why are Kingsbury thrust bearings usually provided with shoes on each side of the collar?

1. To permit ahead and astern operations
2. To prevent overloading of the oil film
3. To compensate for small errors in alignment
4. To distribute the thrust evenly to all parts of the bearing

6-45. That part of the Kingsbury thrust bearing that tilts to permit the formation of a wedge-shaped film of oil is known as the

1. collar
2. lower leveling plate
3. dowel disk
4. shoe

6-46. When the end play of a Kingsbury thrust bearing is measured, the upper half of the bearing must always be bolted down to prevent which of the following conditions?

1. Breaking of the leveling plates
2. Tilting of the base rings
3. Distortion of the shaft
4. Dislocation of the collar

6-47. What parts of a new thrust bearing are permitted to have a slight displacement from the installed position after the bearing has been put into operation?

1. Leveling plates
2. Base rings
3. Thrust shoes
4. Thrust collars

6-48. In a Kingsbury thrust bearing, if you notice an increase in end play of the main thrust bearing, which of the following parts should you examine first?

1. The main shaft coupling
2. The gear teeth surfaces
3. The thrust shoe surfaces
4. The thrust leveling plates

6-49. Before the end play of a main thrust bearing is measured with a dial indicator, the flange surface should be coated with which of the following substances?

1. Oil
2. Paint
3. Prussian blue
4. Tallow

6-50. When checking shaft end play by jacking on the shaft flange, which of the following actions should you take?

1. Rotate the shaft manually
2. Ensure that no structural damages occur
3. Ensure that the shaft movement has plenty of play
4. Both steps 2 and 3 above

Learning Objective: Recognize the components that support the main propulsion shaft and describe their functions.

6-51. What is/are the primary function(s) of the main line shaft bearings?

1. To support the weight of the shafting and hold it in alignment
2. To link the strut tube with the main line shaft
3. To reduce the amount of friction created during operation
4. To prevent the engine from hunting

● Question 6-52 is to be judged True or False.

6-52. Main line shaft spring bearings are lubricated by brass oiler rings passing around an oil reservoir.

6-53. The following statements concern the main propulsion thrust bearing and a main propeller spring bearing. Which statement is correct?

1. Both bearings are lubricated by the main lubricating oil system
2. The former is lubricated by the auxiliary machinery lubricating oil system and the latter by an independent oil system
3. Both bearings are lubricated by the same independent oil system
4. The former may be lubricated by the reduction gear oil system and the latter by an independent oil system

6-54. How often should personnel of a ship in an operating status check the main propulsion shaft bearing lube oil supply levels and temperatures?

1. Daily
2. Twice a day
3. Once during a watch
4. Hourly

6-55. How often should main shaft spring bearing clearance readings be taken?

1. Monthly
2. Quarterly
3. Semi-annually
4. Yearly

6-56. The area between the rotating propeller shaft and the stern tube is sealed by which of the following devices?

1. Fairwater sleeve
2. Stern-tube gland
3. Bearing bushing
4. Bulkhead gland

● Question 6-57 is to be judged True or False.

6-57. A firemain connection is fitted to the forward space of the stuffing box for the purpose of maintaining a positive flow of water through the stern tube.

6-58. Which of the following materials is used to prevent excessive leakage of seawater into the ship through the stern tube?

1. Carbon
2. Rubber
3. Babbitt
4. Flax

6-59. Which of the following types of bushings are usually found on strut bearings?

1. Lignum vitae
2. Laminated resin-bonded
3. Rubber
4. All of the above